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AUTHOR Small, Ruth V.; Venkatesh, Murali
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ABSTRACT

Satisfaction is a construct that is important to the development of intrinsic motivation and the continuing effort to learn. Research that helps to identify those factors that contribute to satisfaction is useful in the design of electronic support systems for individuals and groups. This paper investigates the impact of "need for closure" on information processing and decision confidence (as signified by closure) and the subsequent relationship between confidence and satisfaction with the outcomes of a group decision-making task. A brief review of the literature related to closure and satisfaction is presented, followed by a description of the Cognitive-Motivational Model of Group Member Decision Satisfaction, and concludes with the results of an initial empirical research study with groups using either a computer-based group support system (GSS) or a manual method for supporting group decision-making. The model is discussed in terms of need for closure and extent of information processing; information processing and confidence; group process factors; technology factors; social factors; motivational factors; confidence and satisfaction. The initial research examines the link between closure (cognitive response) and decision satisfaction (affective response) by manipulating motivation (need to delay versus need to expedite) in a laboratory environment using technology-based (VisionQuest) and manual methods. Need to delay (NTD) closure subjects were told that there would be penalties for ineffective solutions to a case study; need to expedite (NTE) subjects were not threatened with a penalty. Results show a positive correlation between decision confidence and decision satisfaction, and that the correlation seems to be stronger for NTD subjects. Closure was found to be a significant predictor of decision satisfaction for the GSS group. Information processing variables were found to be better predictors of closure than variables without an explicit information processing focus. An analysis of ideas generated by all groups was conducted, and results indicate 29% more ideas generated by the GSS groups than in the manual groups. GSS groups had more single and enriched ideas than the manual groups, but fewer multiple ideas. Nine tables illustrate findings. (Contains 59 references.) (MAS)

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ED 383 338

Title:

The Impact of Closure on Satisfaction with Group Decision-Making

Authors:

Ruth V. Small
Assistant Professor

Murali Venkatesh
Assistant Professor

School of Information Studies
Syracuse University

IR017193

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Abstract

Satisfaction is a construct that is important to the development of intrinsic motivation and the continuing effort to learn. Research that helps to identify those factors that contribute to satisfaction is useful in the design of electronic support systems for individuals and groups. This paper investigates the impact of "need for closure" on information processing and decision confidence (as signified by closure) and the subsequent relationship between confidence and satisfaction with the outcomes of a group decision-making task . This paper presents a brief review of the literature related to closure and satisfaction, then describes the Cognitive-Motivational Model of Group Member Decision Satisfaction, and concludes with the results of an initial empirical research study of this model with groups using either a computer-based group system or a manual method for supporting group decision-making.

Introduction

Groupwork has become an important focus of research in education, as evidenced by the growing amount of research on cooperative learning in all educational contexts (e.g. Johnson, Johnson, & Stanne, 1985; Hooper, 1994; Hooper & Hannafin, 1991). Research indicates that students working in cooperative groups are more successful at high level skills such as problem solving and decision-making than when working alone. Group learning situations may include such experiences as simulations, debates, group projects, and case study analyses. In such situations, a group is often faced with a problem or set of problems and the task involves reaching consensus and forming a group judgment or decision.

Although there has been considerable attention in the education literature to the effects of group learning on achievement (e.g. Johnson & Johnson, 1989; Slavin, 1990; Hooper & Hannafin, 1991), until recently there has been considerably less attention paid to affective outcomes, such as satisfaction, with group work, specifically group decision making. Yet, when assessing a decision, group member satisfaction is a critical variable and may play a significant role in decision implementation (Maier, 1970) and group effectiveness (e.g. Van de Ven & Delbecq, 1974).

Despite being a frequently-used research variable, satisfaction has not been adequately conceptualized or defined (Hecht, 1978). When people are asked if they are satisfied with a particular activity or outcome and they say "yes," what does that mean? Does it mean that the task was enjoyable, rewarding, and/or important? Does it mean that they would do more of it or do it again? Thus, research on group member satisfaction may serve two purposes. From a theory-building standpoint, satisfaction can serve as a criterion for research evaluating other variables (Smith, et al., 1966). From a practical standpoint, the study of satisfaction may have direct implications for the conduct of group-based tasks like group decision-making.

Our theory of group member satisfaction is based on Kruglanski's (1989) cognitive-motivational theory of closure, where closure is defined as subjective certainty, reflecting a state of firm knowledge. This state, once attained, signals a degree of closed-mindedness, i.e. the point at which new information bearing on the decision problem will not be actively sought by the decision-maker (Kruglanski, 1989). As a result, we reason that the attainment of closure will be an important component of group member satisfaction with the decision and we have developed a model based on that assertion. This paper reviews some of the related literature, builds on our Cognitive-Motivational Model of Group Member Decision Satisfaction [formerly Closure Model of Decision Satisfaction (Small & Venkatesh, 1994)] and presents the results of an initial research study testing this model.

Closure

The Random House Dictionary of the English Language (1987) defines closure in terms of psychological completeness or certainty]. Closure has been a topic of study in at least three areas---education, management, and psychology.

Educational researchers have tended to focus on the former component without defining "closure" in operational terms. The importance of closure in accomplishing a learning task has been recognized frequently in the education literature. Dubelle (1986) describes closure in terms of outcomes of an activity that bring the major points of a lesson into focus so they may be perceived as an organized whole. Keller (1983) emphasizes a learner's need to perceive various pieces of content as fitting into a whole, thereby experiencing closure and a sense of accomplishment. Ziergarnik (1967) emphasizes the need to bring an instructional task to closure and Brophy (1987) contends that students experience a sense of accomplishment when they complete meaningful tasks. Wlodkowski (1991) advocates attaining "positive closure" as a motivational element in adult education "because it affirms the entire learning process, reinforces the value of the experience, directly or indirectly acknowledges competence, increases cohesiveness within the group,

and encourages the surfacing of inspiration and other beneficial emotions within the learners themselves" (pp 247-248). They all refer to closure as an end state that reflects the accomplishment of a task.

Closure has also been addressed in the management literature on group research but no-one has clearly defined it. In a study comparing interacting nominal group technique (NGT) and delphi groups, Van de Ven and Delbecq (1974) found NGT groups attained "closure," while delphi groups attained "closure with detachment" and interactive group meetings tended to conclude with "high perceived lack of closure." Notably, NGT members were also more satisfied with group process and performance, suggesting a positive link between closure and satisfaction. The authors, however, fail to make such a link and never define closure, conceptually or operationally.

Hagen & Burch (1985) found that the perception of "closure" on a group task was positively related to member satisfaction. However, they, too, do not not define closure. It is also unclear whether satisfaction was due to process factors and/or task outcomes. Bostrom et al. (1993) identify "lack of closure" as one of the major problems behind unproductive meetings; "lack of closure" here describes meetings that typically generate no published outputs, run too long, or are generally inconclusive. Anderson & Robertson (1985) see the human facilitator as promoting "closure" through a mediated resolution of issues. While these references are intriguing, no operational definition of closure is advanced.

Closure has been explored more thoroughly in the psychology literature, most notably by Kruglanski. Kruglanski (1989) incorporates "closure" into a cognitive-motivational theory of knowledge and cognition in which a "need for closure" is assumed to motivate a person to prefer certainty over indeterminacy. Need for closure, largely a situation variable, is imposed by factors in the environment, such as time constraints, a desire to move on to other matters, or the fear of an inaccurate decision.

Closure is an end state, characterized by confidence in the possession of a definite, unambiguous answer to a question, "as opposed to confusion or ambiguity" (Kruglanski & Freund, 1983, p. 450). While a person's need for closure may be characterized by high (hereafter referred to as need to expedite) closure or low (hereafter referred to as need to delay) closure, the underlying concept reflects a "quest for assured knowledge that affords predictability and a base for action" (Kruglanski, 1989, p. 14). Closure theory posits that information processing in judgmental situations is influenced by the decision-maker's need for closure as specified on a continuum of openness to new information (or degree of close-mindedness) (Kruglanski, 1989). Although possibly influenced by individual differences variables (e.g. tolerance for ambiguity, trait curiosity), need for closure is largely a situation-specific variable whereby costs and benefits are assumed to affect level of need for closure when the individual's current state differs from a desired end state. Therefore, the individual must perceive closure as a current benefit in order to have a need to expedite closure sooner rather than later. However, the theory does not consider the affective consequences of either attaining or not attaining closure.

In a need to delay closure state, allowing additional information to be considered, and keeping an open mind before commiting to a decision or course of action because the perceived benefits of delaying closure outweigh the costs of lacking closure. need to delay closure tends to emphasize accuracy (requiring more time on task), while need to expedite closure tends to emphasize other goals (e.g. the need to see oneself as decisive), with accuracy assuming a less critical role. For example, when a decision or action is consequential (e.g. an actual courtroom murder trial), it is reasonable to assume that the decision-maker (juror), given a choice, would delay making a decision in order to process information more extensively before rendering a judgment, given the high cost of judgmental error inherent in the situation (convicting an innocent person). A low need to attain closure tends to emphasize accuracy to avoid the high cost of error. However, even in need to delay closure situations, as in the above example, an individual will be motivated to eventually attain closure. Only under certain circumstances will decisions be avoided altogether (Corbin, 1980; Mann & Janis, 1982).

In a state of need to expedite closure, the decision-maker wishes to expedite closure because the perceived benefits outweigh the costs of lacking closure. For example, when a decision is relatively less consequential (e.g. a mock trial), the decision-maker (e.g. student juror) may be more willing to render a quick judgment where the perceived benefits of closure (e.g. more time to do other things) outweigh the perceived costs of lacking closure (e.g. the need to invest additional information processing time and effort). High need to attain closure is strongly influenced by such factors as self-esteem or cognitive consistency, as well as the need for accuracy (Pyszczynski & Greenberg, 1987).

The need for closure also influences the information processing component of the decision-making process (Guzzo, 1982). Uncertainty reduction stimulates information seeking and maintains information acquisition behavior (Lanzetta, 1963). When an individual understands that he has an "information gap" between what he knows and what he wants or needs to know, he will be motivated to seek out the information he needs to close that gap (Lanzetta, 1963).

In decision-making situations, information processing includes both hypothesis generation (i.e. possible solutions based on the information received) and hypothesis evaluation [i.e. selection of the most efficacious solution(s)] (Gettys, Mehle, and Fisher, 1986; Kruglanski, 1989). Mayseless & Kruglanski (1987) found less extensive information processsing was needed to produce a confident judgment under need to expedite closure than need to delay closure conditions (which was experimentally induced by heightening the fear of invalidity and, hence, the need for judgmental accuracy). In the need to delay closure condition, more extensive information processing was required for subjects to feel confident enough to render a judgment believed to be accurate.

Closure and Affect

We extend Kruglanski's (1989) closure theory to include affect. That is, to the extent that a decision-maker is motivated to close the gap between a current state of lack of closure and a desired end state of closure, we posit that attaining that desired end state will promote positive affect, while failure to attain it will cause negative affect, in both high and need to delay closure conditions. In general terms, group member satisfaction is an affective response to some type of cognitive appraisal of accomplishment of a group task, process, composition, or decision (Witteman, 1991; Collins & Guetzkow, 1964). Researchers have found group member satisfaction highly correlated with degree of task accomplishment (e.g. Heslin & Dunphy, 1960; Marquis, Guetzkow & Heyns, 1951), the context on which our research focuses. However, it is unclear from the literature what the appraisal process involves (i.e. how one decides that the task has been adequately accomplished) or how cognitive appraisal (i.e. closure) and the affective response are linked (Hecht, 1978).

Our theory represents the decision-maker as an active evaluator of the adequacy of information processing, using what Corbin (1980) calls the "uncertainty cutoff" as the subjective standard of appraisal. We assert that information processing will continue until the decision-maker has attained the required level of confidence with the knowledge he/she possesses at that point (a subjective assessment) and decides to decide. Closure theory posits that information processing in judgmental situations is influenced by the decision-maker's motivation (need for closure) as specified on a continuum from low to high (Kruglanski, 1989). When this state of closure (or decision confidence) is reached, the decision-maker will halt information processing (albeit temporarily) and make a decision. Thus, satisfaction with the decision at the time the decision is made is the affective outcome of having attained the desired cognitive end state of closure.

Closure should be a stronger predictor of decision satisfaction in need to delay closure conditions than in need to expedite conditions. That is, the strength of the relationship between closure and decision satisfaction will vary depending on whether epistemic motivations emphasize accuracy or other goals. When accuracy is emphasized, confidence (resulting in closure) will be a strong predictor of decision satisfaction, reflecting high subjective value placed on confidence in such situations. When other goals dominate, decision confidence will be a relatively weaker predictor of decision satisfaction.

Group Member Satisfaction

Porter & Lawler (1968) found a relationship between performance and satisfaction in the workplace, where the success of the former is a cause of the latter. In learning situations, satisfaction is often described as the sense of accomplishment that learners feel at the conclusion of a learning event when outcomes of their efforts are consistent with their expectations (e.g. Keller, 1983).

Typically satisfaction is defined and measured in overly simplistic, unidimensional terms (e.g. Was it fun? Are you satisfied?) Klein & Pridemore (1992) measured satisfaction using six related items from the Instructional Materials Motivation Scale (Keller, 1987). In addition to using enjoyment and feeling good, and pleasure as descriptors, the items described satisfaction in terms of "accomplishment," and "practice and feedback."

Some current research points to a relationship between satisfaction and other constructs. For example, Small and Gluck (1994) used a magnitude scaling method to investigate adult student perceptions of the relationships of 35 instructional attribute terms to four major motivational components (attention, relevance, confidence, and satisfaction) comprising Keller's ARCS Model of Motivational Design (e.g. Keller, 1983), a model largely based on expectancy-value theory (Porter & Lawler, 1968). Their results found that feedback and related terms (encouragement, praise, supportiveness) were among the most closely associated to satisfaction. In addition, they explored relationships among the four ARCS components. They found that confidence and satisfaction shared seven of the ten closest attributes. They also found that the attributes related to confidence and satisfaction were significantly different than those related to attention and relevance. They point to this as evidence supporting Keller's claim that the confidence and satisfaction

conditions are closely related to each other, as well as with the "expectancy for success" factor of expectancy-value theory, while attention and relevance conditions are aligned with the "value" factor.

Conceptually, satisfaction derives from an affective or emotional response to a situation. Arnold (1960), in a now widely-accepted characterization, saw satisfaction as an outcome of an appraisal process, with situations "seen as favorable to one's well-being...appraised positively, while those seen as inimical...appraised negatively" (Locke & Latham, 1990, p. 226). A performance goal may serve as the value standard used to assess performance, with positive affect resulting if the standard is exceeded and negative affect when the standard is not met (Locke, 1976).

Often the focus of research is on the individual learner's satisfaction following successful completion of a task. However, when learners are required to work in groups, use group processes, accomplish group goals, and be assessed according to group outcomes, group member satisfaction may not reflect individual satisfaction; i.e. an individual could be satisfied that the group reached a group-level goal but is personally dissatisfied with the result or process (Small & Venkatesh, 1994). This research examines individual satisfaction with accomplishment of a group task.

The Model

Our work extends Kruglanski's (1989) cognitive-motivational perspective to examine decision satisfaction, as researchers have stressed the value of studying satisfaction (e.g. Smith et al., 1957) and decision-making (Corbin, 1980) in motivational terms. The cognitive-motivational perspective on closure centers on information processing effects. As information processing is central to group decision-making (Guzzo, 1982) and GSS environments (DeSanctis & Gallupe, 1987), we reasoned that closure, as a variable associated with information processing, would predict decision satisfaction.

The Cognitive-Motivational Model of Group Member Decision Satisfaction (presented in Figure 1) was first developed at the individual level and then considered in the group environment (Small & Venkatesh, 1994). This model provides a theory-based linking of motivation, information processing, confidence (signifying closure) and satisfaction. This model is based on the following predictions regarding decision satisfaction: (1) if closure is desired or valued (e.g. the cost of judgmental invalidity is low and/or the benefit of rendering an expeditious judgment is high), rendering such a judgment will promote positive affect in the decision-maker and conversely (2) in situations where closure is not desired or valued (the cost of judgmental invalidity is high so the decision-maker has a compelling incentive to "keep an open mind" and delay or postpone making a decision), the decision-maker will experience negative affect if forced to render a judgment (e.g. due to imposed or perceived time constraints). In motivational terms, the first situation signifies a need to expedite closure (confidence) (Kruglanski, 1989). The Cognitive-Motivational Model of Group Member Decision Satisfaction posits a number of paired relationships including need for closure and extent of information processing, information processing and confidence (signifying closure), and confidence and satisfaction. Each are explained briefly below.

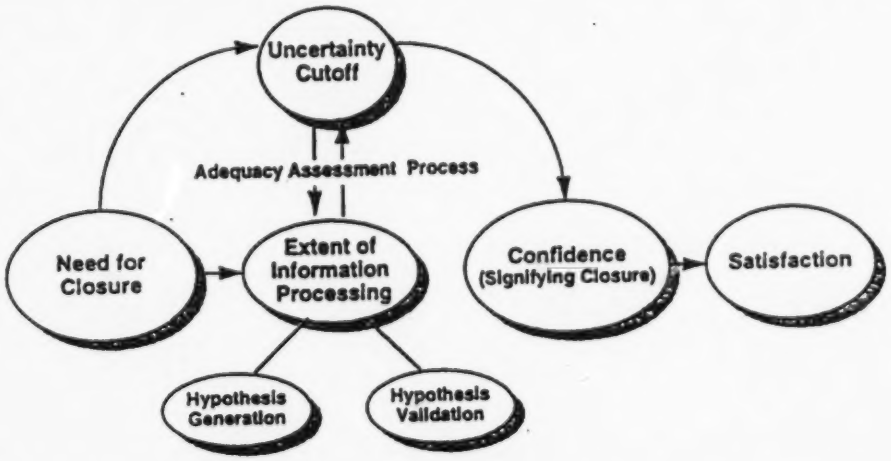

Figure 1. The Cognitive-Motivational Model of Group Member Decision Satisfaction

Need for Closure and Extent of Information Processing. Need for closure (high versus low) regulates the extent of information processing (Kruglanski,1989); i.e. in general, information processing tends to be more extensive (breadth) as well as more intensive (depth) in low (versus high) need for closure conditions (Mayseless & Kruglanski, 1987). Lanzetta (1963) states that under conditions of heightened uncertainty active information acquisition and processing is more probable. He found that for any level of uncertainty, information seeking will be greater the more important the consequences of the decision. Let us consider the individual situations of deciding when to submit a course term paper and when to submit a doctoral dissertation. For the former, need to expedite closure will likely be high, due to perceptions of possible external factors such as time constraints (e.g. inflexible due date), lower comprehensiveness requirement (e.g. 10-page maximum), or less emphasis on quality (e.g. only one of several assignments considered for a grade). However, for the latter the need to delay closure may be quite high and information processing will likely continue for a much longer period of time due to the high cost of error (e.g. submitting an inadequate literature review; insufficient statistical analysis).

Information Processing and Confidence. Confidence, a key outcomes in decision making, signifies certainty (Sniezek, 1992). Information processing and confidence are reciprocally linked; i.e. information processing is undertaken to reduce the level of subjective uncertainty inherent in a decision until the "uncertainty cutoff" is reached, decision confidence is high, and the "timing of choice" is at hand (Corbin, 1980). This cutoff is subjectively defined with reference to a level of confidence that the decision-maker deems acceptable. In the above example, the uncertainty cutoff is most likely to be reached much earlier for the term paper than for the dissertation. If, however, confidence is below the uncertainty cutoff, the decision-maker may be motivated to avoid or delay a decision, which could happen in either of the above examples. Using the uncertainty cutoff idea, our model augments Kruglanski by specifying the motivation behind the decision to halt (albeit temporary) information processing and the decision to decide.

But, one might wonder, what constitutes an acceptable level of confidence and by what criterion is the uncertainty cutoff subjectively defined? A "cost-benefit" analysis of the effects of difference need for closure motivations on the extent of information processing suggests that, for need to expedite conditions, reducing the cost (to the decision-maker) of judgmental invalidity and/or increasing the benefit of rendering an expeditious judgment will limit information processing. Conversely, in need to delay closure conditions, increasing the cost of judgmental invalidity fosters extensive information processing (Kruglanski, 1989).

Intensive processing of available information or gathering more information provide an alternative means "for decreasing uncertainty and for inducing the readiness to decide" (Corbin, 1980, p. 54). Need for closure will regulate information processing until the subjectively-set uncertainty cutoff is exceeded (or some external force intercedes), at which point it will be halted (albeit temporarily) and a decision made. This perspective implies a decision-maker who actively assesses the costs versus benefits of processing information in light of a subjective need for closure. Arguably, then, information processing that is judged as adequate under need to expedite conditions may be judged as inadequate under low need for closure conditions. The student writing the term paper (need to expedite) may decide to stop processing information and complete the task by the due date in order to avoid getting a lower grade for handing in the paper late. The student writing the dissertation (need to delay closure) may decide to delay submission of a final product when she learns of an alternative line of research from another discipline that she has not included in her literature review and believes it will better prepare her for her oral defense. The latter decision-maker would have to be more confident than the former before choosing to halt information processing and make a decision to submit because the stakes will be perceived as higher. (It is assumed that the individual will eventually halt information processing and make a decision.) To summarize, it may be argued that (1) the uncertainty cutoff is defined with reference to the decision-maker's need for closure and (2) confidence during the adequacy assessment process will rely on the uncertainty cutoff to regulate the extent of information processing, with a decision being made when confidence exceeds the cutoff. In the following section, we briefly consider four factors that also appear to influence confidence in groups---group process, technology, social, and motivational factors.

Group Process Factors. Groups that process more information will likely be less confident about their decision due to exposure to multiple member views (Sniezek, 1992). This prediction goes counter to the assumption that more information may be processed to boost confidence (e.g. Lanzetta, 1963). This apparent contradiction may be due to a lack of clarity in the literature on the level at which confidence is measured. More research directly comparing decision confidence at the member and group levels is needed before the link between increased information processing and decision confidence is understood (Sniezek, 1992).

Technology Factors. Research on the use of computer-based group support systems (GSS) suggests that such systems facilitate information processing and exchange in group situations (DeSanctis &

Gallupe, 1987). Group support systems (GSS) are a set of networked electronic tools that facilitate group work, most often in business settings. They typically include software that allows participants to conduct group activities, such as anonymous electronic brainstorming and organization and ranking of alternatives.

To the degree that GSS-use increases the number of alternatives considered by the group (Benbasat & Nault, 1990), it could be argued that group confidence would decrease in GSS groups relative to unsupported groups (e.g. Sniezek, 1992). However, a distinction among types of GSS is needed here. GSS-support has been classified into group communication support systems (GCSS) and group decision support systems (GDSS) (Pinnsonneault & Kraemer, 1989). While the former support group communication processes and have a negative effect on decision confidence and satisfaction, the latter provide decision-aiding techniques intended to reduce uncertainty, resulting in increased decision confidence and satisfaction (DeSanctis & Gallupe, 1987). Our model would predict that, for choice tasks, member decision confidence and decision satisfaction should increase to the degree that GSS supports both hypothesis generation and validation.

Social Factors. The effects of group interaction on group performance and achievement have been widely explored (e.g. Hooper et al., 1994; Hooper & Hannafin, 1991; Webb, 1982). Specifically, Rohrbaugh (1981; 1979) and Ono & Davis (1988) found that group interaction and discussion may increase decision confidence in groups. The goal (explicit or implicit) of reaching consensus may also heighten group confidence. The need for closure may motivate group members to strive for consensus, and the push for consensus may be functionally equivalent to an individual's need for closure (Kruglanski & Webster, 1991).

Motivational Factors. Need for structure may be functionally similar to need for closure; i.e. in individual decision-making, stressing the value of order helps increase decision confidence (Mayseless & Kruglanski, 1987). In group settings, an implicit belief appears to be that "good process leads to good outcomes" (Sniezek, 1991, p. 149). This suggests that positive evaluations (e.g. feedback) of the group interaction process may positively influence decision confidence (Guzzo et al. 1986). Amount of time and effort expended on the task may also affect confidence, with evaluations being positive if people conclude they "worked hard enough (Mayseless & Kruglanski, 1987) and inflated confidence in self-assessments of high effort (Sniezek, 1991).

Confidence and Satisfaction. Closure is operationalized as a cognitive end-state characterized by the group member's confidence in the group decision. While need for closure may encourage close-mindedness toward new information on the topic, Kruglanski (1989) and others (e.g. Pyszczinski & Greenberg, 1987) conceptualize it as a situational index rather than an individual difference. In the model, confidence (a cognitive belief) is shown to predict decision satisfaction (affective attitude) (Fishbein, 1966). Although the two may be positively correlated (Sniezek, 1992; Gallupe, Desanctis & Dicson, 1988; Steeb & Johnston, 1981), they are conceptually distinct. Satisfaction represents an affective attitude toward a decision, while confidence represents a cognitive confidence as to the quality of the decision.

The Research Study

The research reported below represents an initial experiment testing our model. It examines the link between closure (cognitive response) and decision satisfaction (affective response) by manipulating motivation (need to delay versus need to expedite) in a laboratory environment using technology-based (GSS) and manual methods. "Need for closure" is an independent variable, while "confidence" as an end state, is a dependent variable. The terms "subjective certainty" and "confidence" are used synonymously (Sniezek, 1991). Information processing was analyzed on the basis of quantity of ideas.

The following hypotheses were advanced:

Hypothesis 1. Confidence and satisfaction (in decision making) will be positively correlated.

Hypothesis 2. Information processing variables (hypothesis generation and validation) will predict satisfaction through confidence and not directly.

Methods

This research constituted a pilot study for a subsequent larger study. This study was conducted in two phases. The first phase involved manual methods; the second phase involved VisionQuest TM; i.e. a technology-based group support system (GSS). As a result of the first phase, some minor modifications were made to the second phase.

Eighty-one undergraduate and graduate students were subjects enrolled in three college courses. Subjects received course credit for participation. Subjects were randomly assigned to groups (three subjects

per group) (technology vs. no technology) and group conditions (need to delay vs need to expedite closure). Table 1 presents some demographic data for subjects in this study.

Group	Need to Delay Closure #Ss (#Grps)	Need to Expedite Closure #Ss (#Grps)	M	F	UG	G
Technology	21 (7)	21 (7)	24	18	22	20
No technology	18 (6)	21 (7)	21	18	16	23
TOTAL	39 (13)	42 (14)	45	36	38	43

Table 1. Need for Closure, Gender, and Academic Status of Subjects.

The treatments for GSS groups were administered in a univeresity computer research laboratory environment. The treatments for manual groups were administered in a nearby seminar room where group members were seated at a conference table. A different facilitator was used for both groups; however the facilitation was purely procedural and tightly scripted to ensure consistency.

Treatments

High and low evaluation apprehension were used to operationalize need to delay (NTD) vs. need to expedite (NTE) closure respectively (Mayseless & Kruglanski, 1987). NTD closure subjects were informed that their prioritized solutions to a case study problem would be evaluated for quality by a panel of expert judges and there would be penalties for ineffective solutions. This constituted the high evaluation apprehension treatment emphasizing the high cost of judgmental invalidity. NTE subjects were informed that their responses would be reviewed by a panel of experts but there would be no penalty based on solution quality. This constituted the low evaluation apprehension treatment, encouraging quality work but emphasizing no adverse consequences from judgmental invalidity. The treatments were similar in both phases of this research.

The Experimental Task

"The Case of the Unhealthy Hospital" (Kovner, 1991), a case study widely used in management education, was slightly modified as the task in this study. The case describes the hospital CEO's dilemma; charged with putting the hospital's financial house in order, he is faced with a complex set of problems and surrounded by advisors with conflicting interests and opinions. Groups were instructed to recommend two solutions to the hospital CEO.

Measures

NTE closure and NTD closure were the independent variables. Confidence and satisfaction with the decision were the dependent variables. Both were measured at the member-level, from member responses to relevant items in a post-session survey. All lists of brainstormed ideas were collected for analysis.

Procedures

All groups used the generate-evaluate-select process model during the session. A facilitator asked group members to read the task instructions and the task case study. Following a 15-minute period for reading the case study, subjects individually generated solution ideas and all ideas were recorded. Manual groups used the "tablet method" to generate solutions; i.e. jotting a solution on a tablet, returning the tablet to a designated "tablet area" on the table and picking up another tablet to record another idea. The tablet method was used to facilitate the exchange of ideas in an attempt to parallel the "Brainwriting" module (VisionquestTM), the electronic brainstorming tool used by the GSS groups. They were then asked to work as a group to evaluate all ideas and select two prioritized solutions.

All groups were given five minutes for solution generation and 20 minutes for face-to-face discussion, solution evaluation, and prioritization of the two "best" ideas. For manual groups, the facilitator transcribed all solutions from tablets onto a flipchart. For GSS groups, solutions were captured via the Brainwriting module were projected on a public screen. For all groups, the facilitator modified, edited, or added to the public solutions list as directed by the group. Each total session took approximately 90 minutes.

At the end of the session, each subject completed a post-session survey that included five items from Green and Taber's (1980) solution satisfaction index, an instrument widely used in GSS research (e.g. Zigurs, DeSanctis, & Billingsley, 1991). Two of the five items (Q1 and Q2) measured member's confidence in and satisfaction with the decision respectively. Three items (Q3, Q4, Q5) tapped member commitment and input to, and sense of responsibility for, the correctness of the decision. Two additional items focused on session characteristics and member demographics.

Results

GSS and manual groups produced two datasets which were analyzed separately because of the minor modifications made to the procedures after completing the manual group experiment.

Hypothesis 1. Hypothesis 1, which asserted a positive correlation between decision confidence and decision satisfaction, was supported. The Pearson r for both treatment groups was significant at the .05 level (see Tables 2 and 3).

Variable	Coeff.	Std. Error	Std. Coeff.	Tolerance	T	P (2 tail)
Constant	1.557	1.317	0.000		1.183	0.244
Confidence	0.902	0.192	0.713	0.655	4.698	0.000*
Q1	0.055	0.110	-0.072	0.740	-0.503	0.618
Q2	0.102	0.226	-0.063	0.775	-0.454	0.653

Analysis of Variance

Source	Sum of Squares	DF	Mean Sq.	F-ratio	P
Regression	29.037	3	9.679	9.463	0.000*
Residual	38.868	38	1.023		

* significant at .05

DV: Decision Satisfaction; N=42; Mult.R: .654; Squared Mult.R: .428; Adj. Squared Mult.R: .382; Standard Error of Estimate: 1.011

Table 2. Results of Multiple Regression on Confidence and Satisfaction for GSS Groups.

Variable	Coeff.	Std. Error	Std. Coeff.	Tolerance	T	P (2 tail)
Constant	2.334	0.859	0.000		2.718	0.010
Confidence	0.417	0.208	0.381	0.577	2.026	0.05*
Q1	0.173	0.117	0.263	0.659	1.483	0.148
Q2	-0.012	0.147	-0.015	0.621	0.080	0.937

Analysis of Variance

Source	Sum of Squares	DF	Mean Sq.	F-ratio	P
Regression	20.934	3	6.978	5.025	0.006*
Residual	45.823	33	1.389		

* significant at .05

DV: Decision Satisfaction; N=39; Mult.R: .560; Squared Mult.R: .314; Adj. Squared Mult.R: .251; Standard Error of Estimate: 1.178

Table 3. Results of Multiple Regression on Confidence and Satisfaction for Manual Groups.

Correlations for NTD and NTE closure subjects by treatment group appears in Table 4. All correlations are significant at .05. These results suggest that (1) confidence and satisfaction are significantly correlated; (2) the correlation is sensitive to different conditions in that it appears to be stronger for need to delay than for need to expedite . The last finding is of particular interest considering that the need to delay closure treatment was operationalized through high (versus low) evaluation apprehension. The need to delay treatment, by heightening evaluation apprehension via the high cost of judgmental invalidity manipulation, makes the consequences of closure as an end state more salient. Such consequences may be in the positive or negative direction. It follows that the correlation between confidence and decision satisfaction should be even stronger under such conditions (relative to low evaluation apprehension conditions). These results provide strong support for Hypothesis 1.

Treatment	n	NTE Closure	NTD Closure
GSS	42	.62*	.87*
Manual	39	.38*	.64*

* significant at .05

Table 4. Correlations for Need to Expedite (NTE) and Need to Delay (NTD) Closure Subjects by Treatment Group

Hypothesis 2. Hypothesis 2 postulated that information processing variables will not predict decision satisfaction directly, but rather through closure. For GSS groups, closure was a significant predictor of decision satisfaction (see Table 5). On the post-session survey, Q1 ("We generated a relatively complete set of potential solutions") and Q2 ("We evaluated alternatives thoroughly before selecting a solution") were significant predictors of closure . It is notable that Q1 and Q2 show no association with decision satisfaction (p>.05). Together, closure, Q1 and Q2 explained 38% of the variance in decision satisfaction.

Variable	Coeff.	Std. Error	Std. Coeff.	Tolerance	T	P (2 tail)
Constant	1.613	1.068	0.000		1.511	0.139
Q1	0.236	0.084	0.387	0.891	2.823	0.007*
Q2	0.425	0.176	0.332	0.891	2.419	0.020*

Analysis of Variance

Source	Sum of Squares	DF	Mean Sq.	F-ratio	P
Regression	14.636	2	7.318	10.278	0.000*
Residual	27.768	39	0.712		

* significant at .05

DV: Confidence; N=42; Mult.R: .588; Squared Mult.R: .345; Adj. Squared Mult.R: .312; Standard Error of Estimate: .844

Table 5. Results of Multiple Regression on Q1 and Q2 and Satisfaction for GSS Groups.

The results were similar for manual groups. Again, closure was a significant predictor of decision satisfaction (see Table 6). It is notable that Q1 and Q2 show no association with decision satisfaction. For manual groups, closure (Q1 and Q2 together) explained 25% of the variance in decision satisfaction.

Variable	Coeff.	Std. Error	Std. Coeff.	Tolerance	T	P (2 tail)
Constant	3.006	0.486	0.000		6.190	0.000
Q1	0.205	0.090	0.341	0.760	2.285	0.029*
Q2	0.302	0.110	0.412	0.760	2.758	0.009*

Analysis of Variance

Source	Sum of Squares	DF	Mean Sq.	F-ratio	P
Regression	23.577	2	11.789	12.487	0.000*
Residual	32.098	34	0.944		

* significant at .05

DV: Confidence; N=39; Mult.R: .651; Squared Mult.R: .423; Adj. Squared Mult.R: .390; Standard Error of Estimate: .972

Table 6. Results of Multiple Regression on Q1 and Q2 and Satisfaction for Manual Groups.

In summary, the results across GSS and manual groups were consistent with expectations; two information processing variables (Q1 and Q2) best predicted closure but not decision satisfaction. These two variables and closure together explained a significant portion of variance in decision satisfaction. No multicollinearity problems were detected in the analyses above. These results support Hypothesis 2.

An examination was conducted of the link between closure, decision satisfaction and three variables drawn from the Green & Taber's (1980) solution satisfaction index. These items were: "To what extent does the final solution reflect your inputs?" (Q3), "To what extent do you feel committed to the group solution?" (Q4), and "To what extent do you feel personally responsible for the correctness of the group solution? (Q5). For both GSS and manual groups, closure again was the single strongest predictor of decision satisfaction. Q3 and Q4 showed moderate association with closure, but not with the latter. These results indicate that, from among the post-session survey items, information processing variables (Q1 and Q2) were better predictors of closure than variables without an explicit information processing focus (Q3, Q4, and Q5). This is fully consistent with our predictions. These results are notable in that items from a widely-used scale show associations consistent with the model.

Analyses of Idea Solutions. Analyses of ideas generated by all groups were conducted. An initial count of individual's ideas indicated 29% more ideas were generated from subjects in the GSS groups than in the manual groups and that only in the GSS groups was there any difference in the number of ideas depending on need for closure (see Table 7), a phenomenon consistent with the literature (e.g. Benbasat & Nault, 1990).

Group	n	NTE Closure	NTD Closure	TOTAL
Manual	39	85 (50%)	85 (50%)	170
GSS	42	117 (53%)	103 (47%)	220
TOTAL	81	202 (52%)	188 (48%)	390

Table 7. Number of Individual Ideas and Percentage by Need for Expedite (NTE) and Need to Delay (NTD) Closure and Treatment Group

Raters were asked to categorize each brainstormed idea solution on the basis of whether it was (1) a single idea, (2) an "enriched" idea [a single idea with more breadth (multiple steps or parts) or depth (detailed

explanation or clarification)] or (3) multiple ideas (more than one idea contained in a single thought). An example for each category taken from the data appears below in Figure 2.

Single Idea:

"Move all services from the clinics to the hospital except prenatal care and needle exchange."

Enriched Idea:

"Close off-site clinics and move all hospital staff back to hospital. then bus patients to the hospital. They could still see the staff they know/trust."

Multiple Ideas:

"Close down all off-site clinics. Set up a shuttle-bus service between the off-site clinics and the hospital. Use the money saved for city-wide advertising, new doctors & hospital improvements."

Figure 2. Examples of Single, Enriched, and Multiple Ideas.

Additional analyses were conducted on items upon which there was initial disagreement until consensus was reached. Preliminary results appear in Tables 8 and 9.

Treatment	n	Single	Enriched	Multiple
NTD Closure	42	64 (34%)	64 (34%)	60 (32%)
NTE Closure	39	76 (38%)	79 (39%)	47 (23%)

Table 8. Means and Percentages of Single, Enriched, and Multiple Ideas by Subjects with NTD and NTE Closure.

Group	n	Single	Enriched	Multiple
Manual	39	38 (22%)	68 (40%)	64 (38%)
GSS	42	102 (46%)	75 (34%)	43 (20%)

Table 9. Means and Percentages of Single, Enriched, and Multiple Ideas by Subjects in Manual and GSS Treatment Groups

Results indicate that 29% more total ideas were generated from GSS groups. GSS groups had more single and enriched ideas than manual groups but fewer multiple ideas than manual groups. It is possible that if the multiple ideas were teased apart, the results might indicate that manual subjects had as many or even more ideas than GSS subjects. Furthermore NTE closure subjects generated more single and enriched ideas but not multiple ideas than NTD closure subjects. The need to expedite GSS group generated the fewest number of multiple idea solutions. While it is reasonable that the GSS groups would generate a larger number of single ideas because the technology provides limited space for responses, this theory breaks down when comparing the number of enriched and multiple ideas which appear to require equivalent "space" for responding. Further analyses are needed to help explain these results.

In summary, in this research we advanced an operational definition of closure and explored the relationship between confidence (as a cognitive belief preceding closure) and satisfaction in group decision making using GSS and manual methods in an experimental setting. A theoretic, cognitive-motivational framework was used to conceptualize the constructs of interest in a closure model of decision satisfaction. The results, which were consistent with expectations based on the model, suggest that (1) confidence and decision satisfaction are significantly correlated, and (2) information processing variables are significant predictors of confidence, but not of decision satisfaction. Together, confidence and two information processing variables explained a signficant proportion of the variance in decision satisfaction.

Discussion

The Cognitive-Motivational Model of Group Member Decision Satisfaction characterizes the decision-maker as an active evaluator of the adequacy of the "epistemic" process. Need for closure influences adequacy assessment. Information processing deemed extensive in need to expedite conditions may be deemed inadequate in need to delay closure conditions, suggesting that the uncertainty cutoff may be set relatively low in need to expedite conditions and relatively high in need to delay closure conditions.

This model suggests a number of relevant areas for future research on satisfaction and the use of technology support systems for enhancing satisfaction with group work and further development of our model. One promising area is satisfaction as a criterion for assessing other motivation variables. For example, Rotto (1994) and Arnone & Small (1995) posit a relationship between satisfaction and curiosity. Individual differences (e.g.trait curiosity, impulsivity, tolerance for ambiguity) may influence need for closure and, therefore, should be explored. Furthermore, this study explored how potential negative consequences (punishment) affected extent of information processing; but would there be similar results with potential positive consequences (reward)?

Research is needed to investigate group member attitudes (Hooper et al. 1994). Informal discussions with some subjects indicated annoyance with attitudes of some team members (e.g. dominating, lack of empathy). The impact of group dynamics and interactions and of ad hoc groups vs. established teams on confidence and satisfaction are potentially important areas for additional study.

Computers also facilitate feedback and group interaction. Although the current model does not incorporate a feedback component, adding appropriate feedback loops to the model may increase the likelihood of confidence and satisfaction in group work. This is another area for future work.

Although this research examines decision satisfaction, it might be interesting to explore the relationship between closure and process satisfaction. If need for structure is functionally equivalent to need for closure (Mayseless & Kruglanski, 1987), then interventions emphasizing process structure may promote process satisfaction.

Because of their ability to organize and quickly retrieve data, computers are believed to hold great promise for creating environments for developing and enhancing problem-solving and decision-making skills (Duffield, 1994; Flake et al., 1985; Thornburg, 1986). The study of satisfaction may also have direct implications for group work and the development of computer-based systems that support group problem-solving and decision-making in learning contexts.

King & King (1993) describe a study exploring the transfer of decision-making skills to a computer-simulated environment intended to help young students working in pairs to reduce impulsivity in decision-making situations and make more thoughtful decisions. They found instead that in the computer-simulated environment there was a significant increase in impuslivity; i.e. decision making by one partner with no discussion or input from the other.

They suggest that one reason this might have occurred due to their pretest session experience with the game "which could have provided them with a greater degree of confidence to make decisions without their partner's help" (p. 60). They attribute much of the impuslivity to the effects of computer games which require immediate decisions in order to avoid the penalties imposed. They suggest a "braking device" to slow down the decision-making process and the addition of explicit prompts to cause students to be more reflective. The authors suggest that the decision-making process is more than a cognitive activity but that it also incorporates other aspects of an individual, including affect.

Klein & Pridemore (1992) advocate future research that explores the use of technology in group learning situations as well as performance and motivational outcomes in group work. Research that explores both the cognitive and affective aspects of higher order thinking skills such as problem-solving and decision-making will contribute to the development of computer-based systems that enhance those skills.

Computer systems are needed that go beyond merely displaying generated ideas to visually mapping the ideas so that users can see interrelationships among them and judge their characteristics such as depth, relevance, and usefulness of individual solutions. In addition, Steeb and Johnston (1981) suggest that visual aid organizers may help decision-makers deal with information overload more effectively.

Exploration of applications of GSS technology in education may have particular implications for instruction using case studies (e.g. management education). Case study analysis lends itself well to investigation of group member satisfaction since it often involves group analysis and judgment formation.The case study method involves analyzing and processing complex information, generating plausible alternative problem solutions, and making decisions (Hudspeth & Knirk, 1989; Hammond, 1980; Sulkin, 1966).

This line of research may also provide support for the need to teach information skills. For example, Sieber & Solomon (1970) and Lanzetta, (e.g. 1963) assert that teaching students skills such as cue discrimination, hypothesis generation and hypothesis evaluation and information skills such as filtering irrelevant from relevant information will lead to greater information search behavior and decrease uncertainty.

Finally, an analysis of ideas generated looked at quantity of ideas by treatment groups and use of GSS or manual methods. Future research will include analysis of the quality of ideas generated.

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